

Claims

1. A thin film magnetic recording head for perpendicular recording using magnetic media with a soft underlayer comprising:
 - 5 a yoke that includes a flux bearing pole piece, a main pole piece that is attached to the flux bearing pole piece and extends to an air-bearing surface, and a return pole piece that extends to an air-bearing surface;
 a coil that passes through the yoke between the main pole piece and the return pole piece;
 - 10 a trailing shield connected to the return pole piece and extending along the air-bearing surface toward the main pole piece, the trailing shield confronting the main pole piece to form a write gap with a length along the air-bearing surface that is less than a thickness of the coil between the main pole piece and the return pole piece; and
 - 15 a read head with first and second shields with the second shield being separated from the flux bearing pole piece by a separation gap, the separation gap between the main pole piece and the second shield being selected to result in a reluctance between the main pole and the second shield that is substantially larger than a predetermined reluctance between the second shield and the soft
20 underlayer.
2. The thin film magnetic recording head of claim 1 wherein the reluctance
between the main pole and the second shield that is approximately nine times or
more larger than a predetermined reluctance between the second shield and the
25 soft underlayer.

3. The thin film magnetic recording head of claim 1 wherein the separation gap is approximately nine times or more a predetermined air-bearing surface to soft underlayer spacing times a length of a main pole yoke times half a width of the main pole yoke at a back gap divided by a product of a width of the first and second shields at the air-bearing-surface and a thickness of the first and second shields.
4. The thin film magnetic recording head of claim 1 wherein a sink of non-magnetic, electrically conductive material is disposed in the separation gap.
5. The thin film magnetic recording head of claim 4 wherein the sink is recessed from the air-bearing surface.
6. The thin film magnetic recording head of claim 4 wherein the sink has a width in a cross-track direction that is approximately equal to a width of the second shield in the cross-track direction.
7. The thin film magnetic recording head of claim 4 wherein the sink is copper.
8. The thin film magnetic recording head of claim 4 wherein the sink is part of an electrical path from a component in the head to a pad on a surface of the head.
9. The thin film magnetic recording head of claim 1 wherein the trailing shield has a curved stitch-region where the trailing shield attaches to the return pole piece.
10. The thin film magnetic recording head of claim 1 wherein the trailing shield has a straight stitch-region where the trailing shield attaches to the return pole piece.

11. The thin film magnetic recording head of claim 1 wherein the trailing shield has a pedestal portion and a tip portion and the tip portion confronts the main pole piece to form the write gap.
- 5 12. A thin film magnetic recording head for perpendicular recording comprising:
a yoke that includes a main pole piece that extends to an air-bearing surface and a return pole piece that extends to an air-bearing surface;
a coil that passes through the yoke between the main pole piece and the return pole piece; and
10 a trailing shield with a pedestal and a tip, the pedestal being connected to the return pole piece and extending along the air-bearing surface toward the main pole piece, the tip being attached to the pedestal and confronting the main pole piece to form a write gap with a length along the air-bearing surface that is less than a thickness of the coil between the main pole piece and the return pole
15 piece, the tip having a cross-section area orthogonal to the air-bearing surface which is smaller than a cross-section area of the pedestal orthogonal to the air-bearing surface.
13. The thin film magnetic recording head of claim 12 wherein the tip has a
20 cross-track width that is approximately equal to a cross-track width of the main pole piece.
14. The thin film magnetic recording head of claim 12 wherein the tip has a height orthogonal to the ABS that is approximately equal to four times the length
25 of the write gap.
15. The thin film magnetic recording head of claim 12 wherein the pedestal is curved where the pedestal attaches to the return pole piece.
- 30 16. The thin film magnetic recording head of claim 12 wherein the pedestal is straight where the pedestal attaches to the return pole piece.

17. The thin film magnetic recording head of claim 12 further comprising:
a flux bearing pole piece attached to the main pole piece;
a read head with first and second shields with the second shield being
separated from the flux bearing pole piece by a separation gap; and
5 a sink of non-magnetic, electrically conductive material disposed in the
separation gap.
18. The thin film magnetic recording head of claim 17 wherein the sink is part of
an electrical path from a component in the head to a pad on a surface of the
10 head.
19. The thin film magnetic recording head of claim 17 wherein the sink is
recessed from the air-bearing surface.
- 15 20. The thin film magnetic recording head of claim 17 wherein the sink is copper.

21. A thin film magnetic recording head for perpendicular recording comprising:
a yoke that includes flux bearing pole piece, a main pole piece attached to the flux bearing pole piece that extends to an air-bearing surface and a return pole piece that extends to an air-bearing surface;

5 a coil that passes through the yoke between the main pole piece and the return pole piece;

a trailing shield with a pedestal and a tip, the pedestal being connected to the return pole piece and extending along the air-bearing surface toward the main pole piece, the tip being attached to the pedestal and confronting the main pole piece to form a write gap with a length along the air-bearing surface that is less than a thickness of the coil between the main pole piece and the return pole piece, the tip having a cross-section area orthogonal to the air-bearing surface which is smaller than a cross-section area of the pedestal orthogonal to the air-bearing surface and tip having a cross-track width that is approximately equal to
10 a cross-track width of the main pole piece at the air-bearing surface;

15 a read head with first and second shields with the second shield being separated from the flux bearing pole piece by a separation gap; and

a sink of non-magnetic, electrically conductive material disposed in the separation gap.

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